

**Notice of Allowability**

Application No.

10/673,741

Examiner

Isaac T. Tecklu

Applicant(s)

MUTHUKUMAR, KALYAN

Art Unit

2192

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 05/29/2007.
2. ☒ The allowed claim(s) is/are 7-10, 12-15, 18-25 and 27-32 (renumbered as 1-22).
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
  1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached  
1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of  
Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08),  
Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material

5. ☐ Notice of Informal Patent Application
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

  
**TUAN DAM**  
**SUPERVISORY PATENT EXAMINER**

### DETAILED ACTION

1. This action is responsive to the applicant's amendment filed on 05/29/2007.
2. Claims 1-6, 11, 16-17 and 26 have been cancelled.
3. Claims 7-10, 12-15, 18-25 and 27-32 are being allowed.

### EXAMINER'S AMENDMENT

4. An examiner's amendment to the record appear below. Should the change and/or additions be unacceptable to the Applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such amendment, it MUST be submitted no later than the payment of issue fee.

Authorization for examiner's amendment was given in a telephone interview with Mr. Charles E. Steffey, Registration No. 25, 179 on August 1, 2007. A proposed amendment has been received and adopted by the Examiner - See attached on pages 4-10.

### *Allowable Subject Matter*

5. The following is an examiner's statement of reasons for allowance:

As applicant pointed out under Remark section, pages 2-5, Thompson (US 2003/0237070 A1) taken either singly and/or in combination with other cited prior arts, do not spill and fill the computed values held in rotating registers in a software-pipelined loop using rotating stack memory locations for rotating registers, when there are no rotating registers available to hold the computed values, wherein the number of the rotating stack memory locations used for spilling and filling the computed values are equal to the number of simultaneous live values generated by the rotating register, as recited in such manners in each of independent claims 7, 10, 14, 21, 27 and 30. Furthermore, such spilling and filling of live computed values, held in a rotating register, that are live across multiple stages in a software-pipelined loop, using two non-rotating integer registers, when there are no FP rotating registers

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available and when there are no rotating integers available for holding rotating stack memory locations, and when there are not enough non-rotating integer registers available for holding rotating stack memory locations as recited in such manners in independent claim 18.

Prior arts of record do not teach and/or suggest these claimed limitations, thus, all remaining pending claims 7-10, 12-15, 18-25 and 27-32 are allowed.

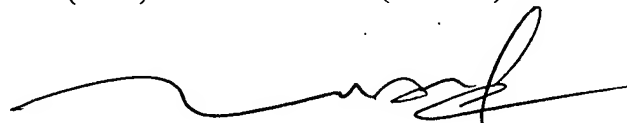
Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### *Conclusion*

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Isaac Tecklu whose telephone number is (571) 272-7957. The examiner can normally be reached on M-TH 9:300A - 8:00P.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**TUAN DAM**  
**SUPERVISORY PATENT EXAMINER**

Isaac Tecklu

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## AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111

Serial Number: 10/673,741

Filing Date: September 29, 2003

Dkt: 884.890US1

Title: SYSTEM, METHOD, AND APPARATUS FOR SPILLING AND FILLING ROTATING REGISTERS IN SOFTWARE-PIPELINED LOOPS

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**IN THE CLAIMS**

For the convenience of the Examination, the amending claims are as follows:

1-6. (Canceled)

7. (Currently Amended) A method of software pipelining for improving efficiency of loop handling, the method comprising:

checking for availability of rotating registers to hold computed values that are live across multiple stages in a software-pipelined loop; and

spilling and filling the computed values held in rotating registers in a software-pipelined loop using rotating stack memory locations for rotating registers, when there are no rotating registers available to hold the computed values, wherein the number of the rotating stack memory locations used for spilling and filling the computed values equals ~~is equal to~~ the number of simultaneous live values generated by the rotating register.

8. (Original) The method of claim 7, wherein the computed values are Floating Point (FP) values.

9. (Original) The method of claim 7, wherein the rotating registers are FP rotating registers.

10. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising:

checking for availability of FP rotating registers to hold FP computed values that are live across multiple stages in a software-pipelined loop; and

spilling and filling the computed values using rotating integer registers for holding addresses of stack memory locations when there are no FP rotating registers available to hold the computed value, the spilling and filling the computed values comprising:

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checking for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed value in stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers, when the  $N+1$  rotating integer registers are available.

11. (Canceled)

12. (Previously Presented) The method of claim 10, wherein spilling and filling the computed value comprises:

storing the computed value in the stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers; and

loading from the stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers based on number of stages between when the loading occurs from the storing of the corresponding computed value.

13. (Original) The method of claim 10, wherein target registers for filling could be any available FP registers.

14. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising:

using post-incremented memory operations for spilling and filling of live computed values, held in a FP rotating register, that are live across multiple stages in a software-pipelined loop, using non-rotating registers, when there are no rotating integer registers available to hold rotating stack memory locations,

checking for availability of  $N+1$  non-rotating integer registers available for spilling and filling, wherein  $N$  is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

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LOOPS

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spilling and filling the computed values in stack memory locations whose addresses are held in corresponding N+1 non-rotating integer registers, when the N+1 non-rotating registers are available.

15. (Original) The method of claim 14, wherein using the non-rotating registers comprises:  
using the non-rotating integer registers.

16-17. (Canceled)

18. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising spilling and filling of live computed values, held in a rotating register, that are live across multiple stages in a software-pipelined loop, using two non-rotating integer registers, when there are no FP rotating registers available and when there are no rotating integer registers available for holding rotating stack memory locations, and when there are not enough non-rotating integer registers available for holding rotating stack memory locations.

19. (Original) The method of claim 18, wherein the two non-rotating registers do not have to be contiguous.

20. (Original) The method of claim 18, wherein the rotating stack memory locations have to be contiguous and in descending order.

21. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising:

checking for availability of rotating integer registers and non-rotating integer registers, to spill and fill computed values held in a FP rotating register, that are live across multiple stages in a software-pipelined loop;

spilling and filling the computed values, held in a FP rotating register, using the rotating integer registers to hold rotating stack memory locations, when there are no FP rotating registers available to hold the computed values;

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LOOPS

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spilling and filling the computed values, held in the FP rotating register, using non-rotating registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values and further when there are no rotating integer registers available for holding rotating stack memory locations; and

spilling and filling the computed values held in the FP rotating register, using two non-rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values, where there are no rotating integer registers available, and further when there are only a few non-rotating integer registers available for holding rotating stack memory locations.

22. (Original) The method of claim 21, wherein spilling and filling the computed values using the rotating integer registers comprises:

checking for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers, when the  $N+1$  rotating integer registers are available.

23. (Original) The method of claim 21, wherein spilling and filling the computed values using non-rotating integer registers comprises:

checking for availability of  $N+1$  non-rotating integer registers available for spilling and filling, wherein  $N$  is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  non-rotating integer registers, when the  $N+1$  non-rotating registers are available.

24. (Original) The method of claim 21, wherein the two non-rotating registers do not have to be contiguous.

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## AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111

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25. (Original) The method of claim 21, wherein the rotating stack memory locations have to be contiguous and in descending order.

26. (Canceled)

27. (Currently Amended) An ~~[[The]]~~ article comprising a computer-readable medium which stores computer-executable instructions, the instructions causing a computer to perform: of claim 26, wherein spilling and filling computed values that are live across multiple stages in a software-pipelined loop using rotating stack memory locations comprises:

checking for availability of rotating integer registers and non-rotating integer registers, to spill and fill computed values held in a FP rotating register, that are live across multiple stages in a software-pipelined loop;

spilling and filling the computed values, held in a FP rotating register, using the rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers available to hold the computed values;

spilling and filling the computed values, held in the FP rotating register, using the non-rotating registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values and further when there are no rotating integer registers available for holding rotating stack memory locations; and

spilling and filling the computed values held in the FP rotating register, using two non-rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values, where there are no rotating integer registers available, and further when there are only a few non-rotating integer registers available for holding rotating stack memory locations.

28. (Original) The article comprising a computer-readable medium which stores computer-executable instructions of claim 27, wherein spilling and filling the computed values using the rotating integer registers comprises:

checking for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed values that needs to be spilled is live in the software-pipelined loop; and



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spilling and filling the computed values in stack memory locations whose addresses are held in corresponding N+1 rotating integer registers, when the N+1 rotating integer registers are available.

29. (Original) The article comprising a computer-readable medium which stores computer-executable instructions of claim 27, wherein spilling and filling the computed values using non-rotating integer registers comprises:

checking for availability of N+1 non-rotating integer registers available for spilling and filling, wherein N is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed values in stack memory locations whose addresses are held in corresponding N+1 non-rotating integer registers, when the N+1 non-rotating registers are available.

30. (Previously Presented) A system comprising:

a bus;

a processor coupled to the bus;

a memory coupled to the processor; and

a network interface coupled to the processor and the memory, wherein the processor to spill and fill multiple computed values, in a register, that are live across multiple stages in a software-pipelined loop, by performing:

checking for availability of rotating integer registers and non-rotating integer registers, to spill and fill computed values held in a FP rotating register, that are live across multiple stages in a software-pipelined loop;

spilling and filling the computed values, held in a FP rotating register, using the rotating integer registers to hold rotating stack memory locations, when there are no FP rotating registers available to hold the computed values;

spilling and filling the computed values, held in the FP rotating register, using the non-rotating registers to hold the rotating stack memory locations, when there are no FP rotating

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registers to hold the computed values and further when there are no rotating integer registers available for holding rotating stack memory locations; and

spilling and filling the computed values held in the FP rotating register, using two non-rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values, where there are no rotating integer registers available, and further when there are only a few non-rotating integer registers available for holding rotating stack memory locations.

31. (Original) The system of claim 30, wherein the processor checks for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed value that needs to be spilled is live in the software-pipelined loop, and spills and fills the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers, when the  $N+1$  rotating integer registers are available.

32. (Original) The system of claim 30, wherein the processor checks for availability of  $N+1$  non-rotating integer registers available for spilling and filling, wherein  $N$  is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop, and spills and fills the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  non-rotating integer registers, when the  $N+1$  non-rotating registers are available.

**SCHWEGMAN ■ LUNDBERG ■ WOESSNER ■ KLUTH**  
Intellectual Property Attorneys

PATENT PROTECTION FOR HIGH TECHNOLOGY

## Fax Transmission

**To:** Examiner Isaac T. Tecklu  
**Company:** US Patent Office (Art Unit 2192)  
**Fax #:** 571-273-7959  
7957

**From:** Amy J. Moriarty  
**Date:** August 1, 2007  
**Re:** US Application No. 10/673,741  
SLWK # 884.890US1

You should receive 11 page(s) including this one.  
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SLWK No. 884.890US1

Client Ref. No. P14830

Matter: SYSTEM, METHOD, AND APPARATUS FOR SPILLING AND FILLING ROTATING REGISTERS  
IN SOFTWARE-PIPELINED LOOPS

Dear Examiner Tecklu:

In response to your phone interview with Charles Steffey, please see the attached supplemental amendment.

With kind regards,

Amy J. Moriarty  
Paralegal  
(612) 371-2127  
amoriarty@slwk.com

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S/N 10/673,741

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT

Applicant: Kalyan Muthukumar

Examiner: Isaac T Tecklu

Serial No.: 10/673,741

Group Art Unit: 2192

Filed: September 29, 2003

Docket No.: 884.890US1

Title: SYSTEM, METHOD, AND APPARATUS FOR SPILLING AND FILLING ROTATING  
REGISTERS IN SOFTWARE-PIPELINED LOOPS

Customer Number: 21186

SUPPLEMENTAL AMENDMENT AND INTERVIEW SUMMARY

MS Amendment

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

This is in response to the Telephone Conference of August 1, 2007 between Examiner  
Tecklu and Applicant's Representative Charles E. Steffey.

## AMENDMENT AND RESPONSE UNDER 37 CFR § 1.111

Serial Number: 10/673,741

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Title: SYSTEM, METHOD, AND APPARATUS FOR SPILLING AND FILLING ROTATING REGISTERS IN SOFTWARE-PIPELINED  
LOOPSIN THE CLAIMS

For the convenience of the Examination, the amending claims are as follows:

1-6. (Canceled)

7. (Currently Amended) A method of software pipelining for improving efficiency of loop handling, the method comprising:

checking for availability of rotating registers to hold computed values that are live across multiple stages in a software-pipelined loop; and

spilling and filling the computed values held in rotating registers in a software-pipelined loop using rotating stack memory locations for rotating registers, when there are no rotating registers available to hold the computed values, wherein the number of the rotating stack memory locations used for spilling and filling the computed values equals ~~is equal to~~ the number of simultaneous live values generated by the rotating register.

8. (Original) The method of claim 7, wherein the computed values are Floating Point (FP) values.

9. (Original) The method of claim 7, wherein the rotating registers are FP rotating registers.

10. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising:

checking for availability of FP rotating registers to hold FP computed values that are live across multiple stages in a software-pipelined loop; and

spilling and filling the computed values using rotating integer registers for holding addresses of stack memory locations when there are no FP rotating registers available to hold the computed value, the spilling and filling the computed values comprising:

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Serial Number: 10/673,741

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Title: SYSTEM, METHOD, AND APPARATUS FOR SPILLING AND FILLING ROTATING REGISTERS IN SOFTWARE-PIPELINED LOOPS

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checking for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed value in stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers, when the  $N+1$  rotating integer registers are available.

## 11. (Canceled)

12. (Previously Presented) The method of claim 10, wherein spilling and filling the computed value comprises:

storing the computed value in the stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers; and

loading from the stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers based on number of stages between when the loading occurs from the storing of the corresponding computed value.

13. (Original) The method of claim 10, wherein target registers for filling could be any available FP registers.

14. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising:

using post-incremented memory operations for spilling and filling of live computed values, held in a FP rotating register, that are live across multiple stages in a software-pipelined loop, using non-rotating registers, when there are no rotating integer registers available to hold rotating stack memory locations,

checking for availability of  $N+1$  non-rotating integer registers available for spilling and filling, wherein  $N$  is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

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spilling and filling the computed values in stack memory locations whose addresses are held in corresponding N+1 non-rotating integer registers, when the N+1 non-rotating registers are available.

15. (Original) The method of claim 14, wherein using the non-rotating registers comprises:  
using the non-rotating integer registers.

16-17. (Canceled)

18. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising spilling and filling of live computed values, held in a rotating register, that are live across multiple stages in a software-pipelined loop, using two non-rotating integer registers, when there are no FP rotating registers available and when there are no rotating integer registers available for holding rotating stack memory locations, and when there are not enough non-rotating integer registers available for holding rotating stack memory locations.

19. (Original) The method of claim 18, wherein the two non-rotating registers do not have to be contiguous.

20. (Original) The method of claim 18, wherein the rotating stack memory locations have to be contiguous and in descending order.

21. (Previously Presented) A method of software pipelining for improving efficiency of loop handling, the method comprising:

checking for availability of rotating integer registers and non-rotating integer registers, to spill and fill computed values held in a FP rotating register, that are live across multiple stages in a software-pipelined loop;

spilling and filling the computed values, held in a FP rotating register, using the rotating integer registers to hold rotating stack memory locations, when there are no FP rotating registers available to hold the computed values;

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Title: SYSTEM, METHOD, AND APPARATUS FOR SPILLING AND FILLING ROTATING REGISTERS IN SOFTWARE-PIPELINED  
LOOPS

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spilling and filling the computed values, held in the FP rotating register, using non-rotating registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values and further when there are no rotating integer registers available for holding rotating stack memory locations; and

spilling and filling the computed values held in the FP rotating register, using two non-rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values, where there are no rotating integer registers available, and further when there are only a few non-rotating integer registers available for holding rotating stack memory locations.

22. (Original) The method of claim 21, wherein spilling and filling the computed values using the rotating integer registers comprises:

checking for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers, when the  $N+1$  rotating integer registers are available.

23. (Original) The method of claim 21, wherein spilling and filling the computed values using non-rotating integer registers comprises:

checking for availability of  $N+1$  non-rotating integer registers available for spilling and filling, wherein  $N$  is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  non-rotating integer registers, when the  $N+1$  non-rotating registers are available.

24. (Original) The method of claim 21, wherein the two non-rotating registers do not have to be contiguous.



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---

25. (Original) The method of claim 21, wherein the rotating stack memory locations have to be contiguous and in descending order.

26. (Canceled)

27. (Currently Amended) An ~~[[The]]~~ article comprising a computer-readable medium which stores computer-executable instructions, the instructions causing a computer to perform: ~~of claim 26, wherein spilling and filling computed values that are live across multiple stages in a software-pipelined loop using rotating stack memory locations comprises:~~

checking for availability of rotating integer registers and non-rotating integer registers, to spill and fill computed values held in a FP rotating register, that are live across multiple stages in a software-pipelined loop;

spilling and filling the computed values, held in a FP rotating register, using the rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers available to hold the computed values;

spilling and filling the computed values, held in the FP rotating register, using the non-rotating registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values and further when there are no rotating integer registers available for holding rotating stack memory locations; and

spilling and filling the computed values held in the FP rotating register, using two non-rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values, where there are no rotating integer registers available, and further when there are only a few non-rotating integer registers available for holding rotating stack memory locations.

28. (Original) The article comprising a computer-readable medium which stores computer-executable instructions of claim 27, wherein spilling and filling the computed values using the rotating integer registers comprises:

checking for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed values that needs to be spilled is live in the software-pipelined loop; and

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spilling and filling the computed values in stack memory locations whose addresses are held in corresponding N+1 rotating integer registers, when the N+1 rotating integer registers are available.

29. (Original) The article comprising a computer-readable medium which stores computer-executable instructions of claim 27, wherein spilling and filling the computed values using non-rotating integer registers comprises:

checking for availability of N+1 non-rotating integer registers available for spilling and filling, wherein N is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop; and

spilling and filling the computed values in stack memory locations whose addresses are held in corresponding N+1 non-rotating integer registers, when the N+1 non-rotating registers are available.

30. (Previously Presented) A system comprising:

a bus;

a processor coupled to the bus;

a memory coupled to the processor; and

a network interface coupled to the processor and the memory, wherein the processor to spill and fill multiple computed values, in a register, that are live across multiple stages in a software-pipelined loop, by performing:

checking for availability of rotating integer registers and non-rotating integer registers, to spill and fill computed values held in a FP rotating register, that are live across multiple stages in a software-pipelined loop;

spilling and filling the computed values, held in a FP rotating register, using the rotating integer registers to hold rotating stack memory locations, when there are no FP rotating registers available to hold the computed values;

spilling and filling the computed values, held in the FP rotating register, using the non-rotating registers to hold the rotating stack memory locations, when there are no FP rotating

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registers to hold the computed values and further when there are no rotating integer registers available for holding rotating stack memory locations; and

spilling and filling the computed values held in the FP rotating register, using two non-rotating integer registers to hold the rotating stack memory locations, when there are no FP rotating registers to hold the computed values, where there are no rotating integer registers available, and further when there are only a few non-rotating integer registers available for holding rotating stack memory locations.

31. (Original) The system of claim 30, wherein the processor checks for availability of  $N+1$  rotating integer registers, wherein  $N$  is number of stages a computed value that needs to be spilled is live in the software-pipelined loop, and spills and fills the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  rotating integer registers, when the  $N+1$  rotating integer registers are available.

32. (Original) The system of claim 30, wherein the processor checks for availability of  $N+1$  non-rotating integer registers available for spilling and filling, wherein  $N$  is a number of stages a computed value that needs to be spilled is live in the software-pipelined loop, and spills and fills the computed values in stack memory locations whose addresses are held in corresponding  $N+1$  non-rotating integer registers, when the  $N+1$  non-rotating registers are available.

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**REMARKS**

This is in response to the Telephone Conference of August 1, 2007 between Examiner Tecklu and Applicant's Representative Charles E. Steffey.

Claims 7 and 27 are amended to correct informalities noted by the Examiner. No claims are added. As a result, claims 7-10, 12-15, 19-25, and 27-32 remain now pending in this application.

**Interview Summary**

Examiner Tecklu pointed out language in claims 7 and 27 that required amendment for clarity. He also requested that Applicant's representative review the other claims and determine if similar changes were needed to them. In the course of the interview, Examiner Tecklu indicated that the claims would all be allowed once the amendments were made.

Set forth above are the changes to the claims that Applicant believes to be needed.

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CONCLUSION

Applicant submits that the claims, as amended remain in condition for allowance as Examiner Tecklu confirmed in the course of the August 1, 2007 interview. Confirmation of the allowance of the claims is earnestly requested. The Examiner is invited to telephone Applicant's attorney ((612) 373-6970) to facilitate any further prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

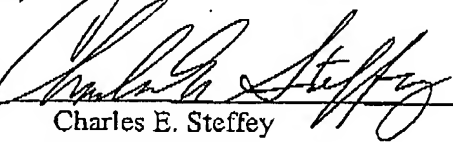
KALYAN MUTHUKUMAR

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Date

August 1, 2007

By

  
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